

A
SAFE AND EASY
REMEDY,

PROPOSED FOR THE RELIEF OF
THE STONE AND GRAVEL,
THE SCURVY, GOUT, &c.

AND
FOR THE DESTRUCTION OF WORMS
IN THE HUMAN BODY,

ILLUSTRATED BY CASES:

TOGETHER WITH

AN EXTEMPORANEOUS METHOD OF IMPREGNATING WATER,
AND OTHER LIQUIDS, WITH FIXED AIR, BY SIMPLE MIXTURE
ONLY, WITHOUT THE ASSISTANCE OF ANY APPARATUS, OR
COMPLICATED MACHINE.

BY NATHANIEL HULME, M.D.

OF THE ROYAL COLLEGE OF PHYSICIANS, LONDON:
PHYSICIAN TO THE CHARTERHOUSE, &c.

THE SECOND EDITION.

L O N D O N :

PRINTED BY JAMES PHILLIPS, FOR G. ROBINSON, IN PATER-NOSTER-ROW;
AND P. ELMSLY, IN THE STRAND.

MDCCLXXVIII.

[Price 2s.]

TO THE MOST NOBLE
H U G H,
DUKE OF NORTHUMBERLAND,
KNIGHT OF THE MOST NOBLE
ORDER OF THE GARTER;
THIS TREATISE
IS,
WITH THE GREATEST RESPECT,
INSCRIBED,
BY HIS GRACE'S
MOST OBEDIENT AND
MOST HUMBLE SERVANT,

Charterhouse-Square,
Jan. 10th, 1778.

NATHANIEL HULME.



INTRODUCTION.

WHEN a new remedy is proposed, it requires a long time, and a multiplicity of experiments, to ascertain its true virtues. What a number of years elapsed, before the Peruvian bark was well known to physicians, and how much did they differ in their accounts; some highly extolling, and others as warmly condemning it! Cicuta, or Hemlock, has been in use, as a medicine, several years, yet its effects upon the human body, in those diseases for which it has been recommended, are far from being determined even to this day; some physicians holding it in high esteem, whilst others reject it as an

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useless

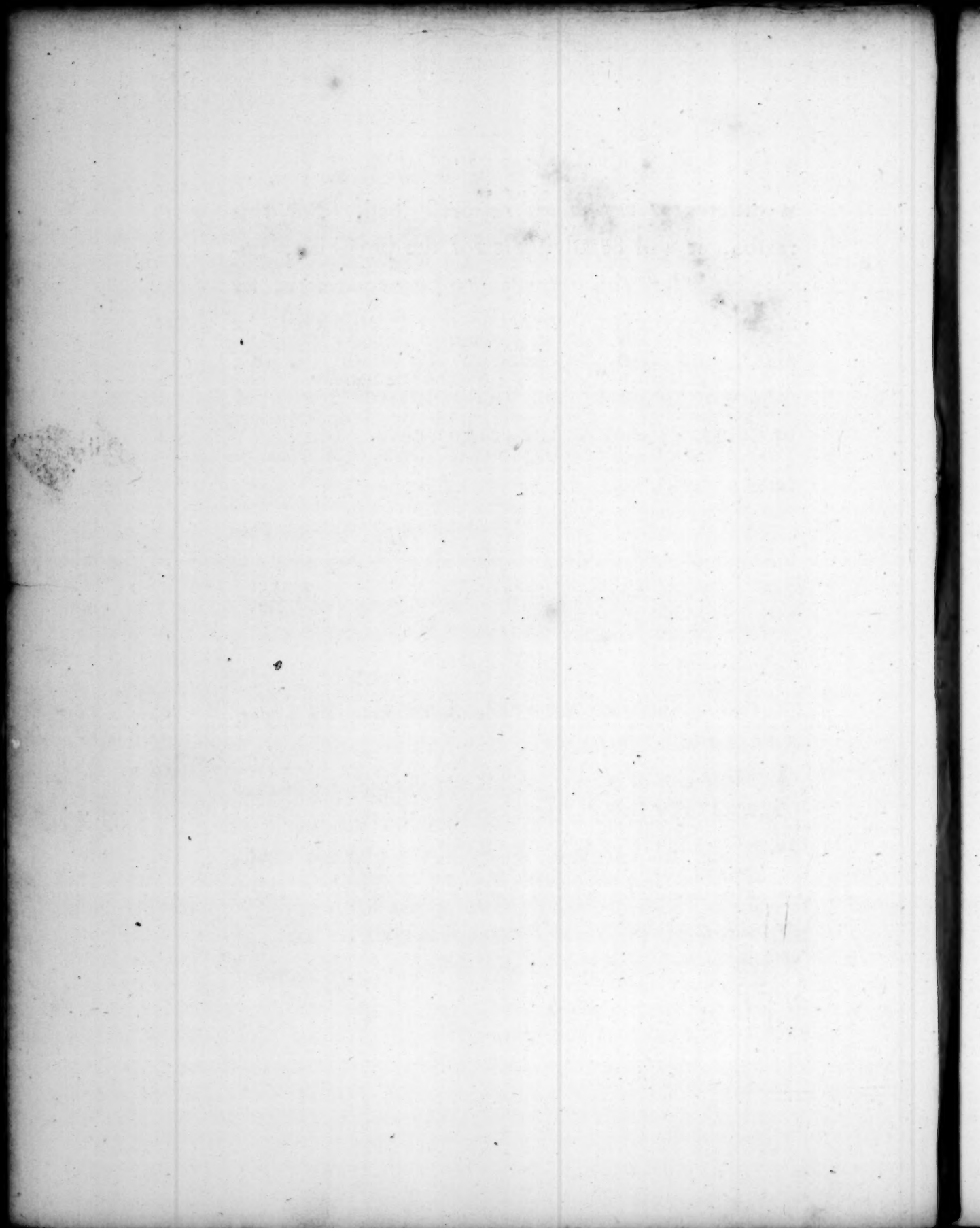
INTRODUCTION.

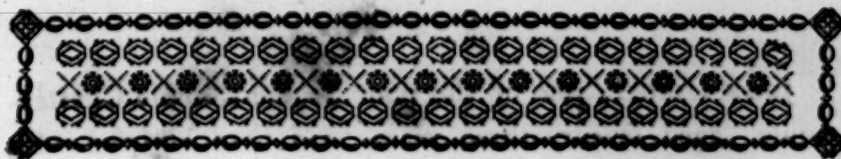
useless drug. The author of the following observations humbly proposes to the publick, the trial of a medicine, which he has lately found of service in various diseases ; at the same time ingenuously owning, that he is not, as yet, fully acquainted how far its virtues may extend, or how be limited : under this restriction, therefore, he wishes, that what he has to advance on this head may be always understood by the candid inquirer. In the mean time humanity forbids him to conceal from the world what he conceives may, in any degree, alleviate maladies to which human nature is daily exposed. The remedy which the author means to recommend, in this treatise, is Salt of Tartar, and weak Spirit of Vitriol, diluted with water, or some other liquid, to be taken separately ; or mixed together in a peculiar manner, which will be described hereafter in the sixth section. The proportion of the vitriolic acid to the salt, is always supposed to be just sufficient to saturate or neutralise the alkali ; unless where it
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I N T R O D U C T I O N .

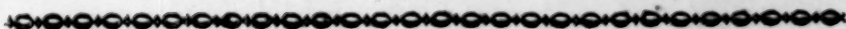
is differently expressed, or prescribed. For this reason, it will be advisable for the physician, before he orders this remedy, to be acquainted, by actual experiment, with the real strength of the alkali and acid, intended to be made use of; otherwise a composition, quite different from what he designed, may be the consequence.

A S A F E





A
SAFE AND EASY
REMEDY, &c.



S E C T. I.
OF THE STONE AND GRAVEL.

Case of a calculous Patient.

THE history of this case I lately published in Latin, and annexed it to a former work, entitled, "*Oratio de Re medica cognoscenda & promovenda*." But as it gave rise to the present publication, and may not be unacceptable to the English reader, I will give a translation of it in this place; and corroborate the method of cure, therein recommended, by further experience.

¹ Pag. 44. & seq.

C

JOHN

JOHN DOBEY, one of the poor Brothers of the Charter-house, aged seventy-three years, had been afflicted with symptoms of the stone in the urinary bladder, for the space of three years. He frequently complained of violent pain in his loins, and a sensation of weight about the *pubes*; and felt pricking pains at the end of the *penis*, and in the region of the bladder. He had a difficulty in making urine, which came away by drops, and sometimes involuntarily; it was high-coloured, and had a thick mucous sediment. At these times he would, now and then, void a small stone or two, of a round figure: but this happened very rarely. He was generally very costive. In the height of his fits, the pain was frequently so excruciating, that he could not forbear crying out in a most violent and lamentable manner, for whole days and nights together. He had not much thirst, but his tongue and mouth, by his continual cries, became so dry and glutinous, as to cleave together.

Various were the means made use of for his relief, but without any effect; except for the present: insomuch that his only hopes seemed to be placed in the operation adapted to this disease; to which, indeed, the miserable patient, worn out with pain, had actually consented. In such a dilemma, what other alternative was left? I will relate the event of this case in a very few words.

What

What I had said in the Oration', concerning elective attraction, and the power of fixed air, in dissolving the *calculus* when out of the body, induced me to try what effect would be produced in this case within the body by a medicine which contained (as it were locked up within itself) a large quantity of fixed air. The patient, therefore, was ordered to take fifteen grains of Salt of Tartar, in three ounces of pure water, four times a day ; and to drink, immediately afterwards, the same quantity of water, with twenty drops of weak Spirit of Vitriol : for I imagined, that these medicines, given separately in this manner, would have their first conflict in the stomach, and would by this means more readily exert their full force, and be more quickly and powerfully conveyed through the whole body. A few days after this, I was greatly surprised to find, at the bottom of the urine, many stony fragments, and a whitish mucous substance, somewhat resembling chalk and water. This whitish matter might likewise be plainly perceived adhering to the edges of the calculous fragments ; as if itself had lately been part of a stone, but was now converted into a chalky substance. When dried and powdered, it was large in bulk, but specifically light. The patient said, that these stony concretions came away principally in the night, or in a morning. During the cure, he complained at times

of heat and pain about the neck of the bladder, and in the *urethra*; which to me seemed to arise from the irritation of so many hard rugged bodies passing that way. Accordingly the medicines were ordered to be omitted, for some time, and these complaints gradually diminished. Afterwards the stony fragments were voided with more ease, and the quantity of whitish cretaceous substance daily increased. Thus the latent *calculus* seemed to come away, in a great measure, in the form of a whitish mucous chalky matter; and the fragments became, as it were, softer and less than at the beginning.

In the space of a month, the patient voided above one hundred and eighty stony fragments, of different magnitudes: to say nothing of those which were unavoidably lost, whenever he had a call to stool. These fragments were of a brown colour when moist; but put on a whitish appearance when dry. Some of them were composed of thin *laminae*; others were more substantial. Each of these fragments was evidently a piece of a larger *calculus*; and had a convex and a concave surface: the former was smooth, and the latter rough.

After the patient had taken the medicines above mentioned about three weeks, the stony fragments came away with

with more ease, and he never had a return of a fit afterwards*. If at any time the body was costive, gently opening catharticks were administered; but, in general, the medicines above recommended, kept the body laxative and promoted urine.

No change was made in the patient's diet, he had water-gruel for breakfast and supper; and for dinner, whatever the table of the Charterhouse afforded. His common drink was pure water, with a small quantity of compound Juniper-water added to it; and now and then a glass of white wine was allowed him; but he very seldom complained of thirst.

Extract of a Letter from COLIN HOSSACK, M. D.
of Colchester, dated the 24th of Nov. 1777.

“ S I R,

I have not been unmindful of your *solvent*; and within a week after I received your letter of the 24th of May, I recommended the use of it to four different patients, who were all affected with calculous complaints. Three of these patients live within six miles

* It is now almost a year since this patient received a cure; and he continues to enjoy a good state of health. But I still order him to take now and then, some of the medicine, by way of prevention.

of this place, and were all greatly relieved in about sixteen or seventeen days ; particularly one, who having been subject to a continual micturition was in about ten days able to retain his urine for some hours, and voided at intervals, some sand and small pieces of *calculi*. The fourth patient, who lives at some distance from me, wrote to me by his Apothecary the 7th of last July ; in which letter he tells me, " That Mr. B. had voided last Saturday a great quantity of sand of a brick-colour, which gave him great relief, and much satisfaction of mind. Two days before the gravel came away, he was in extreme pain, and unable to retain his water."

I am, with great esteem,

S I R,

Your most obedient servant,

COLIN HOSSACK.

To Dr. HULME, at the Charter-
house, London.

By a Letter from Mr. HENRY KIPPING, Apothecary at Brighthelmstone, dated Dec. 2, 1777, I am informed that ELIZABETH CROUCH, an inhabitant of that town, has
found

found great relief, in a nephritick complaint, from the use of the remedy here recommended. That since taking the medicine, which she has done regularly for five months, she has had only one fit, which continued but a short time ; and that she has voided, at different periods, many small stones, one of which was considerably larger than the rest.

In nephritick complaints also, arising from arenaceous gravel, I have frequently observed, that this remedy has had happy effects.

W. P. aged twenty-six years, complained of a pain in his loins, and a difficulty in making urine, which had troubled him at times for four years. His evacuations were regular, but his urine was high-coloured. He had lost his appetite, was feverish, and had a cough. Bleeding and pectoral medicines removed his fever and cough. He then took fifteen grains of Salt of Tartar, diluted with three ounces of pure water, four times a day ; and drank immediately afterwards the same quantity of water, impregnated with as much weak Spirit of Vitriol as was sufficient to saturate that quantity of alkali. After taking this remedy, two or three days, he made urine more freely and oftener than usual, and voided much red gravel, and was soon relieved from his nephritick complaints.

E. M.

E. M. a girl eleven years of age, after a tedious fever, was subject to an incontinency of urine for ten weeks. She had a pain in making water, and the urine was of a flame colour. She took the remedy, as in the former case, for three or four weeks ; during which time she parted with much red gravel, the strangury left her, and she retained her urine as usual.

A. N. aged forty in the fourth month of her pregnancy, complained of a pain in her loins, attended with nephritick symptoms and costiveness. A gentle cathartick was first administered, and then she was ordered the lithontriptick remedy, as last mentioned, which she continued to take for about three weeks. She voided much arenaceous gravel, of a red colour, and got perfectly well.

J. W. a young man, was affected, after making urine, with a pain in the *urethra*, and sometimes at the end of the *penis* ; together with a great heat in his loins, especially on using exercise. He was sometimes loose, at other times costive, and had little appetite, but his pulse was regular. He was subject to the gravel, which was of the red arenaceous kind. He took the lithontriptick remedy, as in the three former cases, four times a day, for the space of three weeks, and the calculous symptoms were removed.

Great

Great care should be taken, in calculous complaints, that the medicines prescribed be pure and genuine; especially the Salt, which should be fresh and dry. And let it be remembered once for all, that both the Salt of Tartar, and the weak Spirit of Vitriol, in all cases where they are recommended in this treatise, are meant by the author, to be strictly prepared according to the directions given for them in the London Pharmacopœia; otherwise the effects expected from them may be frustrated. It may not be amiss also to observe, that distilled water, when it can be had, seems preferable to common water, in calculous diseases, for diluting the medicines above mentioned.

S E C T. II.

O F T H E S C U R V Y.

I Have treated expressly in another place of this disease, so fatal to seamen^{*}; but shall beg leave to add here some further instructions relating to its cure.

D. M. aged fifty years, applied to me for relief in the month of April 1777. His countenance was fallow and bloated. His gums were spongy and livid, and much swollen; his breath was highly offensive. He had a difficulty of breathing on motion, was very weak, and complained

^{*} Libell. de Scorbuto, Lond. MDCCCLXVIII.

of a weariness and stiffness in his limbs. His rest was disturbed. He was greatly affected by cold, especially his mouth and face ; so that when he went into the open air, he was always obliged to hold a handkerchief up to those parts. His legs were hard and swelled ; and some *cicatrices* he had thereon were of a livid colour. He had a multiplicity of small livid spots, which spread over the fore arms and thighs. His gums were so very tender, that he could not eat any thing but what was very soft. After I had hit upon the method of giving the Salt of Tartar, and weak Spirit of Vitriol separately, as in the case of JOHN DOBEY, I was fully persuaded that the same method would cure the scurvy : and therefore gladly embraced this opportunity of trying its effects. Accordingly the patient was ordered to take fifteen grains of Salt of Tartar, in three ounces of water ; and to drink immediately afterwards the same quantity of water, acidulated with as much weak Spirit of Vitriol as was sufficient to saturate that quantity of alkali. These were repeated four times a day. He had not taken these medicines more than five or six days, before he found his strength increased, and the livid spots on the fore arms and thighs begin to die away ; his gums were also more firm, and of a lively red. In two weeks he had no complaints remaining, except a little stiffness in his thighs after walking. There was no change made in the patient's diet ; nor did he take any other medicines than those now mentioned.

For

For cure of the Scurvy at Sea.

Take of pure Salt of Tartar one ounce (Troy weight) ; dissolve it in sixteen ounces of common water ; and call it the *Alkaline Mixture*. Also, take of weak Spirit of Vitriol two ounces (in measure), of common water fourteen ounces, so as to make in the whole sixteen ounces, to be called the *Acid Mixture*. Let the patient take half an ounce (in measure) of the *Alkaline Mixture*, in three ounces of common water, four times a day : and immediately afterwards let him take half an ounce of the *Acid Mixture* in the same quantity of water : and continue these medicines till all the scorbutick symptoms disappear, and the patient's strength be restored ; which may be expected to happen in about the space of three weeks. If occasion should require, the dose may be increased to double the quantity. In this composition the acid, by design, is made predominant. Before the patient begins the course, he should take a dose of some gently cathartick medicine ; and if the body should be costive at any time during the course, it should now and then be rendered gently laxative. It is hardly necessary to mention that the patient, while under cure, should be confined as much as possible to the vegetable part of the ship's diet.

For

For prevention of the Scurvy at Sea.

If these medicines were given only twice or thrice a day to a ship's crew, or any part thereof inclined to the scurvy, I am apt to think that the disease might be prevented from increasing, or be entirely removed. Or whenever the whole ship's crew is in danger of being attacked with the scurvy, let the water, which is used by the seamen for their common drink, be daily impregnated with the alkaline salt and vitriolick acid in the manner described in the sixth section of this treatise.

I shall conclude this part of my subject by observing, that the medicines, which are here recommended, seem to be excellently adapted to the marine service, as also to the use of the army. They lie in a small compass, are very cheap, and preserve their virtues entire for many years; nor are they liable to change by any climate whatever. Their virtues are highly concentrated, and moreover they have this further excellence, that they require no preparation, but are quickly ready for use. In a word, the author cannot but recommend them to the particular notice of those who preside over our naval and military affairs.

S E C T.

S E C T. III.

O F T H E G O U T .

WHAT first induced me to give the above-mentioned remedy to persons liable to the gout, was a conversation I had on this subject, some time ago, with an ingenious friend ; who told me he had long entertained an opinion, that the chief cause of that disease is a retention of too much fixed air in the body, which ought to be discharged, chiefly by the pores of the skin. Hence the gout, said he, is more prevalent, *cæteris paribus*, in cold than in warm climates ; in sedentary persons, than in those who use much exercise. Hence also the luxurious and athletick man will be peculiarly subject to this complaint, from his high mode of living, and drinking plentifully of such liquids as abound with fixed air ; such as wines of various kinds, malt liquors and cyder. He observed, at the same time, that Dr. MACBRIDE, in his *Experimental Essays*, was the only author he had met with, who had thrown out a hint of this kind. This opinion seemed very plausible and ingenious. The difficulty then was how to come at the fact by experiment. After some reflection I imagined, that if a medicine abounding with fixed air, were given

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daily

daily for a length of time to persons greatly subject to the gout, it would bring the matter to a pretty full proof. For if the disease was really owing to fixed air, then this method should increase the malady, and bring on gouty complaints; but on trial it seemed to have had quite the contrary effect, as far as a judgment may be formed from the two following cases.

R. J. aged seventy-two years, of a robust habit of body, had been subject to the gout twenty-nine years. He sometimes had a fit twice a year, but always once, and that commonly in the Autumn. It generally continued upon him one, two, or three months. The first joint of the great toe, in one or both feet, was the part principally affected. Sometimes his head, sometimes his stomach, suffered. The disorder also fell upon the joints of the fingers, and would frequently affect the whole hand. By repeated attacks of this kind, he has quite lost the use of several joints of the fingers. He is subject to no other complaint, and in general, his appetite is very good, and he uses a moderate degree of exercise. He took the medicine daily, for half a year together. The quantity, for the first three or four months, was fifteen grains of Salt of Tartar, three times a day, diluted with three ounces of pure water; taking immediately afterwards the same quantity of water, acidulated

acidulated with as much weak Spirit of Vitriol as would saturate that portion of alkali. He then took double the quantity of the alkali and acid, mixed together in a peculiar manner, which will be described hereafter ; but only repeated it night and morning. The medicine in both forms agreed with him perfectly well through the whole course ; and he enjoyed a better state of health, after he began to take it, than he had done before for many years past. The gout did not in the least return this last Autumn.

J. M. aged fifty-six, had been afflicted with the gout ten years. The fit generally came on in the month of January or February, and continued three or four weeks ; but the last paroxysm he had, held him thirteen weeks. The great toe was the part principally affected, which first grew painful and inflamed, then swelled ; but as the tumour increased, the pain was alleviated. The pain was more severe in the night than in the day. The disorder seldom affected both feet at the same time, but first one, and then the other. The skin, during the fit, was generally hot and dry ; and the body costive. This last year both his hands were greatly affected, but chiefly the right ; and a cretaceous concretion formed in the middle joint of the ring-finger of the right hand. He took the medicine daily, as in the last mentioned case, for the space of four months, and observed that it
gave

gave him unusual spirits ; and he has had no gouty complaints since.

Future experience alone must determine how far this remedy may succeed against this disease, which is generally called the *opprobrium medicorum*. But is there no cure for the gout ? Let physicians endeavour at least to find out a remedy. For my part, I am rather inclined to think that there is a remedy in nature, (and perhaps generally of the most simple kind) not only for the gout, but for most diseases where the *viscera* are sound, the vascular system pervious, and the body not worn out with age. How dreadful and sudden, for example, are the effects of the poison arising from the bite of a viper ! yet a little oil proves its certain antidote. What a loathsome and corroding disease is the *lues venerea* ! but a small portion of mercury can subdue all its virulence. What a change does the ague make upon the human body ! a sudden coldness and trembling seize every limb, succeeded by a burning fever and excessive thirst : by repeated attacks the whole body becomes feeble and emaciated, the countenance pale, sickly, and dejected ; notwithstanding which, give but the bark of a certain tree, and the patient is soon restored to his former health. Look upon the mariner, just arrived from a tedious voyage, labouring under the scurvy ; his legs are swelled and contracted ;

tracted ; his countenance is fallow and bloated ; his breath is horribly offensive ; his gums are swelled and putrid ; his teeth are loosened from their sockets ; and his limbs are discoloured with livid spots ; nevertheless, in pot-herbs and flesh-broths, the common food of man, he finds an infallible cure ! So simple and wonderful are the operations of nature, could we but always find them out.

S E C T. IV.

OF HECTICK FEVERS, WITH
CONSUMPTION.

I Have frequently given the remedy above described in hectick fevers, attended with pulmonary complaints, and I think with some success ; and therefore recommend it, for future trial, to the judicious practitioner.

J. A. aged thirty-five years, had been afflicted with a violent cough ten months. He expectorated a thick yellowish matter, and had a hectick fever, accompanied with a *diarrhœa*, which last had been upon him half a year. An emetick was first administered, and then a gently opening medicine ; at the same time a vesicatory was applied be-

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tween

tween the shoulders. After which he took fifteen grains of Salt of Tartar in three ounces of water, four times a day ; and immediately afterwards the same quantity of water, with as much weak Spirit of Vitriol as was sufficient to saturate the alkali ; these he continued twenty-one days, without any other remedies, and his complaints were removed.

M. W. nineteen years of age, complained of a violent cough, which had tormented her two months. Her expectoration was sometimes yellowish, or greenish, and sometimes bloody. She had a pain at the pit of her stomach, and in her right side. Her body was regular, and the *menfes* appeared at the stated times ; but her pulse was quick and weak. She was thirsty, and had lost her appetite. She complained of frequent shiverings, followed by feverish heats ; and had been afflicted with night-sweats for two months. She took the alkali and the acid, as in the former case, and in three weeks she thought herself well.

G. W. aged thirty-nine years, had been troubled with a violent cough six weeks, spitting up a yellowish thick phlegm. He had a pain at the pit of his stomach, and in his left side, which had afflicted him for three weeks ; attended with a difficulty of breathing, on motion. His evacuations
were

were regular, but his appetite failed him, and he was thirsty. He had a hectic fever, accompanied with night-sweats. Besides the common remedies for his cough, he took the medicines, as in the two former cases, about a month, and found great relief from them.

J. S. in the twenty-fifth year of his age, laboured under a violent cough, and expectorated a thick greenish matter. He had a hectic fever, with a quick weak pulse, and a pain in the epigastrick region. His body was costive, he had lost his appetite, and frequently vomited up his food. The abovesaid remedy was administered to him three times a day, for two or three weeks; the fever abated, his appetite returned, and the vomiting was restrained. Pectoral medicines were used at the same time, on account of the cough.

Of Fevers in general.

The same remedy has been found useful in putrid and other fevers, especially at the beginning, after the necessary evacuations have been made. In febrile diseases, in general, I recommend the alkali and the acid to be given in a combined state, in a peculiar manner, which will be shewn in the sixth section. And where the Peruvian bark is indicated, a decoction of that celebrated febrifuge may be medicated with them in the same manner.

To

To illustrate this by an example : A girl aged twelve years, was seized with a fever and great difficulty of swallowing, together with a scarlet efflorescence which covered the whole body. The skin was dry, and impressed upon the touch a disagreeable biting heat. There was great thirst, but the tongue was clean and of a lively red, and the patient discharged much phlegm from the throat. A painful tumour fixed on the side of the neck, a little below the ear, but did not come to suppuration. The eyes were greatly inflamed, and there was almost a constant *delirium*, with a very quick weak pulse. A dry tickling cough attended, and the body was rather costive. The chief remedy, in this case, was a decoction of the bark of Peru, impregnated with Salt of Tartar and weak Spirit of Vitriol as described hereafter, which was frequently repeated, and with apparent advantage.

Of the Dysentery.

This medicine, assisted with other helps, according to the different indications, bids fair for relieving the dysentery, and some kinds of *diarrhæa*.

M. D. twenty-two years of age, complained of much pain below the navel, which had continued four months ;
and

and was accompanied with mucous stools streaked with blood. Her *menfes* were regular. She was feverish, and had a quick weak pulse, with frequent shiverings; and also complained of a pain in the back part of the head. Evacuants were first made use of, and then this remedy was given three times a day, as an antiseptick. The patient found herself greatly relieved by it, and the disorder was soon after removed.

S E C T. V.

O F W O R M S.

THE human body is frequently infested with worms of various kinds, which not only prove troublesome, but are sometimes attended with dangerous consequences. Children are particularly subject to these verminous animals, which irritating their tender and delicate frames, induce a multiplicity of complaints, some of which prove fatal. And what adds to the misfortune of infants is, that most of the remedies, which are recommended for the destruction of worms, are either harsh in their nature, or violent in their operation. How many lives have fallen a sacrifice to anthelminthick cakes, worm-killing powders,

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and

and draſtick purges ! If a medicine then could be hit upon, for the deſtruction of worms, which would be perfectly ſafe and agreeable to the infantile ſtate, it would be a real acquisition to the *materia medica*. The remedy, which is here recommended, promiſes to be ſuch, being merely a watery fluid ; and yet it ſeems very pernicious to theſe animals, and alſo to aquaticks ; even the lively eel cannot withſtand its deleterious power, though in its own element : at the ſame time it is, as far as I have obſerved, perfectly harmleſs to the human body.

S. P. a ſingle woman, aged thirty, had been ſubject to hyſterick complaints for ſome years. Among various other ailments, ſhe had a troubleſome pain at the ſtomach, and below the navel, and was of a coſtive habit of body, but had her *menſes* regularly. She was miſerably tormented with worms, reſembling earth-worms, about four or five inches long ; which ſeemed to poſſeſs the whole inteſtinal canal. She voided them alive, ſometimes by the mouth, ſometimes downwards, and ſometimes they came away along with the urine, (without any motions to ſtool) which induced both her and her mother to ſay, that they came from the bladder. And what ſeemed to confirm them in their opinion was, that before the worms came away with the urine, a violent ſtrangury always preceded, and a dragging-pain (as ſhe

she termed it) from the navel downwards; and immediately after the worms were evacuated she was easier. She had taken a variety of medicines for her general complaints, by the advice of other physicians as well as myself, without much relief. I then thought of prescribing the alkali and the acid, in the manner above mentioned, on account of the strangury. These she took four times a day, and after a few days she observed several worms to be emitted by stool, but remarked that they were all dead; whereas before this time they came away in a living state. By pursuing this plan for a few weeks, and interposing now and then a cathartick, she voided no more worms, and recovered a better state of health than she had enjoyed for a long time. This case induced me to make the two following experiments.

EXPERIMENT I.

I impregnated a quantity of river water with the alkali and the acid, by a peculiar method which will be described hereafter, and threw into the liquor a common earth-worm. It immediately coiled itself up, and twisted about, shewing the greatest signs of uneasiness, till it died, which happened in a very short space of time. After it was dead, a number of air-bubbles collected upon its whole surface, and buoyed it up to the top of the liquor. This experiment was often repeated.

repeated. If a worm was taken up by its middle, upon a piece of stick, and held over the water, so as just to touch it, the animal would directly jump up, and show great dread of the liquor.

EXPERIMENT II.

I was then desirous to know whether aquatick animals could live in this water. To make the experiment the more complete, I fixed upon the eel as a fish the most tenacious of life. As soon as it was thrown into the impregnated water, it swam briskly round the side of the vessel which contained it, as if in search of a purer element ; but finding none, it showed greater signs of uneasiness, by darting more briskly through the water, and struggling. After this its motion grew weaker and weaker, till it became to all appearance dead ; which happened in a few minutes. The struggling at the latter end was so violent, in one or two instances, that the fish leaped quite out of the vessel ; but this agitation does not always happen. Sometimes the fish, before it dies, turns itself on its back, and swims about in that posture. After the eel becomes motionless, if it be kept in the impregnated water for some time, it inevitably dies ; but if it be taken out soon after it has lost all powers of motion, it will generally revive. And the first
signs

signs of life are a swelling about the gills, and a bursting out of air-bubbles from thence.

The manner of medicating water, for the destruction of worms, may be learned by consulting the fourth experiment in the following section. This water may be given freely to drink as an anthelminthic ; and may also be injected into the intestines, for the same purpose, as occasion requires. In this last case, and in all other instances where warm water is necessary, the water should always be heated first, and then reduced to its proper degree of warmth for the intended use, before it be medicated ; otherwise a large quantity of the volatile part will evaporate by the action of the fire.

S E C T. VI.

EXTEMPORANEOUS METHOD OF IMPREGNATING WATER, AND OTHER LIQUIDS, WITH FIXED AIR.

THE ingenious Dr. PRIESTLEY, in the account of his method of impregnating common water with fixed air, expresses himself in the following words : “ Though what I have done in this business has certainly the least merit
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possible with respect to *ingenuity*, I shall always consider it as one of the *happiest* thoughts that ever occurred to me ; because it has proved to be of very singular *benefit* to mankind, and will, I doubt not, be of much more consequence in a course of time¹."

His *apparatus* consisted of a glass vessel filled with water, which was then inverted and placed in another vessel, in the form of a bowl or basin, with a little water in it. To these was added a flexible pipe, fixed to a bladder ; the latter of which had one end tied round a perforated cork, and the hole kept open by means of a quill. The cork was fitted to a phial, two-thirds of which was filled with chalk, just covered with water. When in use, a little oil of vitriol was poured upon the chalk and water, which presently set at liberty a considerable quantity of fixed air, that distended the bladder ; and this being pressed, the air forced its way through the pipe, and ascended into the glass vessel of water ; the water of which, at the same time, descended and came into the basin. The several parts of this *apparatus* are delineated in his Experiments and Observations on different kinds of air. Vol. II. pag. 263.

¹ Exprim. and Observ. on different kinds of air. Vol. II. pag. 269.

Another

Another *apparatus*, for the impregnation of water with fixed air, made entirely of glass, was afterwards invented by Dr. NOOTH, and improved by Mr. PARKER, which is the kind now generally made use of, and which, for distinction's sake, we will call the *glass apparatus*. This is also represented by a drawing in PRIESTLEY's Observations on Air. Vol. II. pag. 302.

I have, for some time past, been in possession of a method of impregnating water with fixed air, *by simple mixture only*, without the assistance of any *apparatus*. What first led me to this method, was my manner of giving the Salt of Tartar and Spirit of Vitriol separately, for the cure of the stone, as mentioned above in the case of JOHN DOBEY. For observing that the patient, when he took those medicines, did not complain of any unusual sensations in the stomach, which I imagined would have arisen from the ebullition or discharge of air by the conflict of the alkali and acid. when they met together in that ventricle, I was curious to know how they acted on each other out of the body. For this purpose I was led to make the following experiments.

EXPERIMENT I.

Fifteen grains of Salt of Tartar were dissolved in three ounces of river water, and put into an eight-ounce phial ;
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to this were added gradually three ounces of the same kind of water, acidulated with as much weak Spirit of Vitriol as was sufficient to saturate that quantity of alkali : but no ebullition ensued, as might have been expected ; yet I could perceive a small intestine motion to take place through the whole body of water. The composition tasted acidulous, similar to water impregnated with fixed air, by means of the *glass apparatus*. On shaking the liquor in the phial somewhat briskly, a quantity of air was immediately discharged from it.

EXPERIMENT II.

To know whether the air, which was discharged from the liquor by shaking, was fixed air, I put six ounces of the same kind of liquor into a seven-ounce phial, and into another phial of five ounces, I put four ounces of lime-water ; then inserting a bent glass tube into the neck of each phial, secured by a proper luting, I applied heat to the phial containing the water, impregnated with the Salt of Tartar and Spirit of Vitriol. As soon as the heat took effect, streams of air - bubbles rose plentifully from the whole body of water, which passing over, by means of the bent tube, into the lime-water, soon caused it to grow turbid and milky, and to precipitate a white substance. The
phials

phials were then removed, and when the turbid mixture had stood long enough to allow the precipitate all to subside, I poured off the clear, and dried the sediment, which appeared like powdered chalk, and effervesced violently with Spirit of Vitriol. This experiment was repeated several times.

EXPERIMENT III.

Six ounces of the water, impregnated with the Salt of Tartar and Spirit of Vitriol, as in the first experiment, were exposed to the heat of boiling water, for an hour or upwards : by this means the water lost its pleasant acidulous taste, and became vapid ; and being added to lime-water, it made no impression upon it.

EXPERIMENT IV.

I then increased the quantity of Salt of Tartar, in the proportion of half a drachm to three ounces of water ; adding three ounces of water, acidulated with as much weak Spirit of Vitriol as would saturate the alkali, as in the first experiment. The mixture was made very gradually, and with great caution, to give as little motion to the two liquors as possible. During the mixture a great number of very small air-bubbles formed throughout the whole body of the liquor,

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and rose gradually to the top. The water tasted very brisk and acidulous, and sparkled when poured out of one glass into another. On shaking the phial strongly, a large quantity of air was discharged; and by continuing this operation for some time, the brisk acidulated taste gradually evaporated. Heat applied to the phial had the same effect. This air also precipitated lime-water, in the same manner as in the second experiment, but much more powerfully. The more slowly and carefully the mixture of the alkaline and acid liquors are made, in this experiment, the more strongly will the water be charged with fixed air: for this reason it is best to let the second liquor run gradually down the side of the vessel, which is to contain them. From these experiments I conclude, that if an alkali and acid be diluted separately with a *certain* quantity of water, and then gradually mixed together, they will act *silently* on each other; and that by this process the fixed air of the alkali will be gently extricated from its basis, and immediately diffuse and incorporate itself into every adjacent particle of the water, till the whole fluid be fully saturated.

EXPERIMENT V.

To have some comparative idea of the quantity of air which water would imbibe by this method, and by that
with

with the *glass apparatus*, the two subsequent experiments were made. Having filled a two-ounce phial with river water, impregnated with fixed air in the manner described in the last experiment, its mouth was covered with a piece of leather tied closely round its neck, and pierced with a hole in the middle. This hole was secured by a slip of bladder, fastened also round the neck of the phial, which served as a valve to let out air from the impregnated water, and to prevent any other fluid from entering. A wide mouthed phial, containing ten ounces, was then filled with water and inverted (its mouth being covered with a piece of moistened bladder) and placed over the neck of the two-ounce phial, which was previously put upright into a pan containing water more than sufficient to cover it, and then the bladder was gently withdrawn. After this the pan was placed upon the fire, the two phials being kept upright in it, the water was gradually heated, and kept in a boiling state the space of one hour or more. By this process, the air contained in the impregnated water of the two-ounce phial was expelled, and rose up in air-bubbles through the body of water in the inverted phial, and lodged in the top part of the vessel; the water descending in proportion to the quantity of air which ascended. Before the *apparatus* was removed from the fire, a mark was made upon the inverted phial (or recipient of the air) as low as where the water

water had descended ; and after the vessels cooled, the space of the inverted phial, which the air had occupied, was filled with water, which being measured, was found equal to three ounces and two drachms.

EXPERIMENT VI.

The same experiment as the last was made with two ounces of water impregnated with fixed air, by means of the *glass apparatus* ; and the quantity of air expelled was less by several drachms than with the Salt of Tartar and Spirit of Vitriol, as in the former experiment. These two experiments were frequently repeated, and their results found very unequal, though both made at the same time and in the same pan, the quantity of air expelled differing greatly at different times ; but in every instance, the water impregnated with the Salt of Tartar and Spirit of Vitriol produced the largest quantity of air.

EXPERIMENT VII.

By the fourth experiment we may learn how to impregnate common water very strongly, and extemporaneously, with that fine volatile principle so much admired in Pyrmont, Spa, Seltzer, and other mineral waters. Six ounces of
Pyrmont

Pŷrmont water were exposed to the open air, and the phial which contained it was frequently and violently agitated, till its volatile spirit was evaporated ; then Salt of Tartar and Spirit of Vitriol were added, as directed in the fourth experiment, and it immediately recovered a brisk acidulous taste, and a sparkling quality.

EXPERIMENT VIII.

One grain of salt of steel was thrown into a pint, or sixteen ounces, of river water thus impregnated ; the salt quickly dissolved, and imparted a chalybeate property to it ; by which means it resembled those mineral waters which abound with fixed air and iron. I then thought of impregnating some natural chalybeate water with this volatile principle, by means of the alkali and acid. For this purpose I visited the chalybeate springs at Hampstead and Islington, and made the experiment at the wells. The waters, by this process, immediately acquired a pleasant brisk taste, and sparkled when poured out of one glass into another. This is an easy and elegant method of communicating the fine volatile spirit to the chalybeate waters at Tunbridge, and in other parts of England ; and perhaps thereby of rendering them equal in virtue, in many cases, to those at Pŷrmont and Spa.

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By previously knowing the principal contents of various mineral springs, the physician may be enabled to imitate them with a great degree of accuracy, and sometimes even improve their virtues. Artificial mineral waters have this further advantage, that their medicinal powers may be varied according to the constitution of the patient, and the circumstances of the disease. Sometimes, for example, it may be necessary that an alkali should be predominant, sometimes an acid ; at other times a perfectly neutral salt may be most proper ; sometimes also the vegetable alkali, sometimes the fossil, may be used to advantage. A chalybeate property, in mineral waters, may be very beneficial in some cases ; in others it may be injurious : and these inconveniences frequently happen in the natural mineral waters ; but in composing the artificial we may vary them at pleasure, by adding what may be proper for the patient's complaint, and leaving out what might be improper. The intelligent reader will observe that, in the impregnation of water, and other liquids, with fixed air, by means of an alkali and acid, a portion of neutral salt is always generated at the same time.

EXPERIMENT IX.

Being now fully satisfied that water might be highly impregnated with fixed air, *by simple mixture only*, I proceeded

to apply it to other liquids. Half a drachm of Salt of Tartar was dissolved in three ounces of a decoction of Peruvian bark ; to this were gradually added three ounces of the same decoction, acidulated with as much weak Spirit of Vitriol as was sufficient to saturate the alkali. The mixture tasted subacid and agreeable. I esteem this as an excellent remedy in putrid fevers, and other diseases where the bark and antisepticks are indicated. Cordials may be added at pleasure, as occasion requires.

EXPERIMENT X.

A mixture was made, consisting of three parts water and one of rum. Half a drachm of Salt of Tartar was then dissolved in three ounces of this liquor, and an equal quantity of the same liquid was gradually added, being first acidulated with as much weak Spirit of Vitriol as was sufficient to saturate the alkali. The composition acquired, by this means, a brisk lively taste, quite different from that ardent one which rum and water simply have without this addition. Brandy and water were treated in the same manner, and nearly with the like success.

EXPERIMENT

EXPERIMENT XI.

Equal quantities of Madeira wine and water were mixed together, and medicated, as in the preceding experiment ; the composition tasted pleasant and acidulous, and sparkled when poured into a wine glass. Several other kinds of wine were tried, and acquired the same properties.

EXPERIMENT XII.

A friend of mine having some Champagne wine which had not any sparkling quality, three ounces of it were alkalized with half a drachm of the Salt, and the same quantity was acidulated with the vitriolick Spirit ; they were then added together very cautiously, and the wine immediately recovered a ~~sp~~ighly brisk taste, and sparkled much when poured out of one glass into another.

EXPERIMENT XIII.

Cyder and Perry were exposed to the open air till they had lost their volatile pungent taste ; they were then treated as in the last experiment, and they directly acquired the same kind of fine sparkling spirit as the Champagne wine just mentioned.

EXPERIMENT

EXPERIMENT XIV.

Ale was kept in an open vessel till it had lost its spirit, and was become vapid. To six ounces of this liquor were added the alkali and acid, as above directed, and by this means it recovered a bright amber colour, mantled, and tasted fine and brisk; and when poured into a glass, formed a strong flowery head, like a fresh bottle of old ale. The same experiment was made with small beer, and with the same effect, in some degree. If officers in the army and navy were always to supply themselves with a quantity of the alkali and acid, in time of war, these might probably be often of the greatest utility to them in correcting bad liquors, which they are frequently obliged to make use of; for they appear by these experiments to have a power of meliorating both aqueous, spirituous, vinous, and other potable liquids. These medicinal ingredients seem to claim the particular attention of those persons, whose lot it is to visit the unhealthy parts of the East and West-Indies, or of the coast of Guinea; as they may help to purify the corrupted waters of these countries, and destroy the noxious *animalcula* with which they abound*. In such pestilential climates, perhaps it may be of the utmost consequence to strangers, for the preservation of health, to medicate with the alkali and acid

* Vid. pag. 24.

not only the water, but all their liquors. And if they should be used daily, on these occasions, in the common drink, then a small proportion of each to a large quantity of liquid will be sufficient.

EXPERIMENT XV.

Among other liquids, I was very desirous of impregnating milk with the alkali and acid ; and after making some trials, I at last happily succeeded. Half a drachm of Salt of Tartar was first dissolved in a pint of *cold* milk ; then one ounce of water, acidulated with as much weak Spirit of Vitriol as would saturate the alkali, was cautiously added. The milk, by this means, did not coagulate, but contracted a grateful subacid taste, very much resembling that of butter-milk. This gave me much pleasure, as it promises to be of great use in consumptive cases, and other complaints, where a nutritive and antiputrescent diet is required. In some nephritick maladies also, it may prove very beneficial ; especially where there is any hæmorrhage or ulceration, as it is a soft healing diuretick, and may be taken by way of diet. It may possibly be of great service likewise in the gout, if taken regularly every day for breakfast and supper. In various diseases incident to children it also promises great success, and particularly in worm-cases ; as may be collected from what has been said in the foregoing pages.

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